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JOURNAL

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OF THE

MASSACHUSETTS ASSOCIATION

OF

BOARDS OF HEALTH

An Official Quarterly Record of
Information for the Public

JANUARY, 1900

Proceedings of the October Quarterly Meeting

Subjects: Rapid Diagnosis of Diphtheria by Direct Swab Examinations.—Food Infection by the Typhoid Bacillus

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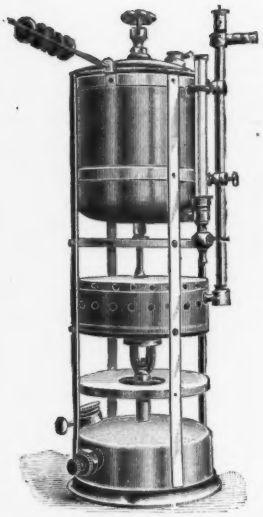

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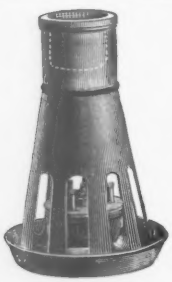

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October Meeting, 1899

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THE JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston in March, 1890, with the following objects: the advancement of sanitary science in the Commonwealth of Massachusetts; the promotion of better organization and co-operation in the local Boards of Health; the uniform enforcement of sanitary laws and regulations; and the establishment of pleasant social relations among the members of the Association.

All persons holding appointments as members of a Board of Health in a Massachusetts city or town, the executive officers of such a local board, and the members of the State Board of Health are eligible to membership. Other persons may be elected members by vote of the Association. The annual dues are one dollar and fifty cents, and should be paid to the Treasurer, James B. Field, M.D., 329 Westford Street, Lowell, Mass.

The Association holds four regular meetings each year, the annual or January meeting always being held in Boston.

THE OFFICIAL JOURNAL OF THE ASSOCIATION is a quarterly publication, containing the papers read at the meetings, together with verbatim reports of the discussions following them. No part of this matter is printed in any other periodical.

The JOURNAL will present, from quarter to quarter, a fair and adequate picture of the progress of practical sanitary science as applied to the needs of a modern community. The various subjects which are reviewed in the quarterly meetings of the Association are treated by experts qualified to speak from daily experience in Public Health offices, who, as men of science are careful to be scientific and comprehensive, and who, as public officers, are no less careful to speak pertinently and so as to be easily intelligible to the layman.

The JOURNAL, in a word, appeals to all whose interests touch the questions of sanitation and hygiene,— to the architect, the school-committee-man, the manufacturer, the contractor, and, above all, to the busy practitioner who has no time for any reading but what is brief and to the point.

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All communications to the Association should be addressed to the Secretary, **EDWIN FARNHAM, M.D., City Hall, Cambridge, Mass.**

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JOURNAL OF THE

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

ORGANIZED 1890.

[The Association as a body is not responsible for statements or opinions of any of its members.]

VOL. IX. January, 1900. No. 4.

OCTOBER MEETING

OF THE

Massachusetts Association of Boards of Health.

The quarterly meeting of the Massachusetts Association of Boards of Health was held at the Town Hall, Leominster, on the afternoon of Thursday, Oct. 26, 1899, the Association being the guests of the Selectmen of the town. Dr. Henry P. Walcott, the President, presided, and, when the members had gathered around the dining-table, opened the formal proceedings by saying,—

Gentlemen, I wish to present to you Chairman Cook, of Leominster, who desires to welcome us.

ADDRESS OF WELCOME BY MR. CHARLES C. COOK, CHAIRMAN OF THE BOARD OF SELECTMEN.

Mr. President and Gentlemen,— It gives me great pleasure, on behalf of the citizens of Leominster, to extend to you a most hearty and cordial welcome in our midst to-day. Among the various boards and commissions of this Commonwealth, this Board is, no doubt, the most important; for by your protection our cities and towns are guarded against unsanitary conditions, and the public is guarded

against dangerous diseases. From time to time these meetings are held; and the public is interested and instructed, and in a measure helps to carry out your wise suggestions. Still, your duties are fraught with hard work, and often with unjust and severe criticism. If there is any man in this world that needs that quality in his general make-up commonly known as "sand," it is the man who is a member of a board of health [applause]. Gentlemen, we have such a board in Leominster. They are so thoroughly saturated with sand that grit is spread all over their smiling countenances, and we re-elect them every year [applause].

Now, gentlemen, we want you all to enjoy yourselves, to have a good time. Let dull care fly to the winds, and let this day be one of the most pleasant in the history of this Association. The latch-string hangs on the outside of all our doors, and it is your own fault if you don't pull it and come in. I won't delay this banquet by making a speech, but throw you in a bunch all the good things that an orator could say in two hours and a half, and close by welcoming you again and again to Leominster [great applause].

Dinner followed. At its close business was proceeded with, the President introducing it as follows: —

The Executive Committee desire to present to the Association the following names of candidates for admission to this body: —

Dr. J. J. Goodwin	Clinton.
Allen G. Butterick, Esq.	Lancaster.
Dr. E. A. Darling	Cambridge.
Dr. Frank L. Morse	Boston.
Dr. Otis H. Marion	Brighton.
Dr. Henry S. Rowen	Brighton.
Dr. Francis E. Corey	Westboro.
C. S. Henry, Esq.	Westboro.
Dr. Asa R. Pattee	Falmouth.
Dr. F. F. M'Carthy	Marlboro.

Is it your pleasure that these gentlemen become members of the Association?

The gentlemen named were elected members of the Association.

THE PRESIDENT.— The Secretary of this body, Dr. Farnham, is unavoidably absent from this meeting.

MR. PILSBURY (Boston).— Mr. Chairman, I nominate Mr. Coffey, of Worcester, to serve as Secretary *pro tem.*

The motion was adopted.

THE PRESIDENT.— Mr. Coffey is duly elected, and will read the records of the last meeting of this Association.

The Secretary *pro tem.* read the records of the previous meeting.

THE PRESIDENT.— You have heard the records read by the Secretary. Is there any amendment or any addition to be made thereto? If not, they will stand as the records of the last meeting of this Association. Is there any general business to come before the Association at this time?

PROFESSOR SEDGWICK (Boston).— Mr. President, while all the members are present and while the excellent repast which we have enjoyed is, so to speak, still in our mouths, I think that the Association may well return thanks to the Selectmen of the town of Leominster, to the members of the Board of Health of that town, and to the citizens whom they represent, for the very excellent entertainment provided for this Association to-day. The hospitality of Leominster has been generous, and it has been most welcome. I assure you, sir [addressing the host], as a representative of your town, that this Association deeply appreciates the hospitality thus shown and the courtesy extended to us. I move, Mr. President, that the thanks of the Association be returned to the citizens of Leominster and their representatives [applause].

THE PRESIDENT.— That is a vote which the President of this Association has great pleasure in putting. All those in favor of it will signify it by saying ay.

The order of your exercises will be slightly interrupted — temporarily interrupted — by the fact that I propose a certain displacement of the papers here. Dr. Hill finds it necessary to leave rather earlier than the rest of us, probably; and the first paper presented to the Association will be a paper on "Rapid Diagnosis in Diphtheria by Direct Swab Examinations," by Dr. H. W. Hill, of Boston. I introduce Dr. Hill to this Association.

RAPID DIAGNOSIS OF DIPHTHERIA BY DIRECT SWAB EXAMINATIONS.

FROM THE LABORATORY OF THE BOSTON BOARD OF HEALTH.

BY HIBBERT WINSLOW HILL, M.D.

Mr. President and Gentlemen,— By the courtesy of Dr. Walcott, I have the privilege of reading this paper out of turn, having to get away early to leave for Minneapolis. I desire to thank Dr. Walcott for allowing this.

An apology for again appearing before you may this time carry with it the excuse that I wish to present a method, as practised by us, which has proved a considerable time-saver in the diagnosis of diphtheria. The method is by no means new; but we have of late carried it out systematically in the laboratory of the Boston Board of Health, and the results may be of interest to you.

It is, of course, a matter of common knowledge that the usual outfit for bacteriological diphtheria diagnosis consists of a tube containing serum and another tube containing a swab, with a card for particulars. The physician rubs the infected swab on the serum, and sends the serum tube to the laboratory for incubation.

In some places — in Providence, R.I., and the State of New Jersey, among others — the outfit consists of the swab and card only, omitting the serum tube. On the receipt of such an outfit at the laboratory, the swabs are rubbed over the surfaces of serum in tubes by some one connected with the laboratory; and these tubes are then incubated. This method presents the advantage that the outfit never depreciates with keeping, as does that outfit which contains the serum tube. It has the disadvantage that it requires a skilled and careful person to receive the swabs and prepare the cultures for incubation, whereas in the more common method all that is required from the person who receives the cultures is the placing of the culture boxes in the incubator properly.

Both outfits imply the incubation of the serum tube, usually over night. Both outfits meet, however, all the requirements for a "rapid diagnosis," since all that is necessary for the rapid method is the

examination of the material which remains adherent to the swab after the latter has been rubbed on the serum, or, if this is unsuccessful, an incubation of the serum tube for six hours, followed by the usual incubation for fifteen hours.

The process of swab examination is of the simplest kind. A drop of water is placed on a glass slide, and the cotton end of the swab is rolled on the slide in the water, considerable pressure being used in order to squeeze the material thoroughly out of the cotton. The preparation is dried, passed over the Bunsen flame once or twice, stained with Loeffler's methylene blue in the ordinary way, and placed under the microscope.

In comparing this with the ordinary method, using serum tubes after incubation, it will be seen that an examination can be made from the swab within five minutes after its receipt, whereas the ordinary incubation requires fourteen or fifteen hours as a minimum. Indeed, if a culture is taken in the morning of one day, the result is not usually available until the morning of the next, or twenty-four hours later.

A wait of only five minutes is such a decided gain over a wait of fifteen to twenty-four hours that the question naturally arises why this method is not at once adopted, to the exclusion of the serum tube and incubation method.

I do not think that this rapid method will supersede the established method for the following reasons: —

First. The recognition of diphtheria bacilli under the microscope in the "natural" state, direct from the throat, is more difficult than their recognition in the "cultivated" state, after incubation. I shall refer to the differences in morphology later on.

Second. The swab, in being rubbed on the serum to inoculate the serum tube, may have most of the bacilli removed from it to the serum, so that the subsequent rubbing on the glass slide yields a preparation with few or no organisms in it. If, to avoid this, the swab is rubbed on the glass before it is rubbed on the serum, the organisms may all be left on the glass, so that the serum culture is a failure. Nor does it answer this objection to say that it would not matter whether the serum culture is a failure or not, so long as the organisms are present on the slide, for the reason, already referred

to, that the organism in its "natural" state is sometimes very difficult to recognize, so difficult indeed that a diagnosis cannot always be arrived at from an otherwise successful swab preparation. This objection might, it is true, be met by using outfits containing a serum tube and *two* swabs instead of one, with instructions to use one of the swabs for inoculation of the serum and to return the other, after rubbing it also on the suspected membrane, to its own tube, for direct examination. Simpler still, the physician may be directed to use the swab from the ordinary single swab outfit, for inoculating the serum in the ordinary way, and then, before returning the swab to its own tube, again rubbing it over the suspected membrane in the throat.

Both of these methods introduce, however, other complications, but perhaps they are worth trying.

Third. The rapid method is only reliable when the bacilli are found. A negative diagnosis from the swab is of very little value. You will remember that, when a serum culture is used, a negative result is obtained in five to ten per cent. of the cases for diagnosis which subsequently turn out positive. The number of negative swabs from positive cases is much larger even than this.

The rapid method is, therefore, of real value only in cases for diagnosis, not in cases for release, and only in cases for diagnosis when the result is positive.

The bacilli are usually more difficult to recognize from a release case than from a diagnosis case, even on a serum culture; and the difficulty is exaggerated in swab examinations. This is, however, of little moment; for the same haste is not required for release as for diagnosis, so that the serum method remains, in every way, the most reliable and satisfactory method for release purposes.

Our rules are as follows: —

Swab examinations are made only on cases for diagnosis. A request for the examination must accompany the culture. The result, if positive, is final. If the result is negative, the case is considered doubtful, but probably negative. If the result is unsatisfactory, no diagnosis is given.

In all cases, positive, negative, or unsatisfactory, incubation of the serum tube is proceeded with, in the positive cases as a confirmatory measure, in the others as a necessity for satisfactory diagnosis.

If the swab and culture comes into the laboratory before noon, a five-hour incubation of the culture is given; that is, it is put into the incubator at once and examined at 5 P.M. A negative or unsatisfactory result from the swab examination, made immediately on receipt of the outfit, may thus receive early correction, since it is often possible to find the bacilli on the serum after five hours' incubation, although the swab examination failed to detect them. Finally, the usual over-night incubation is proceeded with, because the culture may sometimes be found positive next day, when both swab and five-hour incubation yielded negative results.

It may seem that this procedure is a complicated one, giving much extra work. As a matter of fact, however, a careful and exact routine once established, it becomes a very easy and simple matter. The refusal to examine release cultures by this method reduces the unprofitable work very much, and the saving of time in positive cases for diagnosis is so great that it is well worth the extra trouble.

For the benefit of the bacteriologist who has not yet attempted the rapid method, a few words are added relating to the morphology of the "natural" bacilli.

The "natural" bacilli are usually smaller and much more regular in outline than the "cultivated" ones. They stain as intensely and sometimes show similar granules and vacuoles (so called). The red or purplish-red granules, common in cultivated forms and described in a previous paper, are also sometimes present. After a five-hour incubation the bacilli take on a morphology intermediate between the swab forms and the "cultivated" forms found after the ordinary fifteen-hour incubation. In brief, the swab (or "natural") and the five-hour forms from a case for diagnosis resemble somewhat the "cultivated" forms from a case for release late in the course of convalescence. The recognition of one is about as difficult as that of the other; and, if the preparation comes from the nose, it is not wise to make a positive diagnosis from the swab, unless extremely typical forms are found. Nor would I advise any man, however familiar with the cultivated forms he may be, to attempt diagnosis from the "natural" swab forms until he has made a series of careful comparative studies, which may easily be done by examining every day for some

weeks the swabs accompanying his positive serum cultures, as well as the cultures themselves. The faculty for recognizing all sorts and kinds of diphtheria bacilli can be cultivated until it becomes an intuition; but experience and practice are essentials to success, and it is not surprising that rules as to morphology cannot be given much more definitely than are those outlined above. On the other hand, I am convinced that no board of health whose bacteriologist will thus prepare himself for the rapid method will ever regret its careful and conservative use on the lines here laid down. A few statistics from our own work are appended, to show the results obtained so far.

Any one of twenty-seven different possible combinations of results may be obtained from the same case; for the swab may be positive negative, or unsatisfactory, the succeeding five-hour incubation may be positive, negative, or unsatisfactory, and the final fifteen-hour incubation may be positive, negative, or unsatisfactory. Thus a swab may be unsatisfactory, the five-hour positive, and the fifteen-hour negative, or the swabs positive, the five-hour positive, and the fifteen-hour negative, or the swabs positive, the five-hour negative, and the fifteen-hour positive, and so on to twenty-seven combinations. Of course, the commoner combinations are all three positive or all three negative, or one or more unsatisfactory, the others being positive or negative. The point I want to make is that the bacteriologist must not be discouraged in the face of apparently contradictory results in following this method. He must be prepared for some such, and remember that the positive results, whether from swabs, five-hour, or fifteen-hour examinations, overrule all others. A negative result has comparatively little weight at any time, and no weight at all in the face of a positive result. Our results have been as follows, most of them being obtained during the last four months: —

Sixty-six cases were examined by both swab and fifteen-hour culture. Of the sixty-six cases, thirty-two proved positive on fifteen-hour culture. The swab examinations from these thirty-two showed twenty positives, seven negatives, and five unsatisfactories. In other words, we were able to make a diagnosis by this rapid method in about sixty-two per cent. of the positive cases from fifteen to twenty-four hours earlier than by the ordinary method.

It is rather striking that in three cases on which the fifteen-hour

cultures were negative the swab was positive, being confirmed by subsequent cultures in two cases. The third did not present any further cultures. In these three cases, then, a positive diagnosis was furnished thirty-six to forty-eight hours earlier than by the ordinary method.

It will be seen that negative swab examinations are unreliable; for, out of a total of thirty-four negative swab examinations, seven were in error, or over twenty per cent. Moreover, the proportion of unsatisfactory swabs is high, reaching fifteen per cent. of the total number made.

The five-hour incubation is somewhat more reliable. Out of a total of forty-seven cases examined by both five-hour and fifteen-hour incubations, twenty-three proved positive on fifteen-hour incubation. Twenty of these were positive after six hours, the other three being unsatisfactory. By the five-hour method, then, we were able to save from nine to eighteen hours on about eighty-six per cent. of these positive cases. In four cases on which the fifteen-hour incubation gave a negative result the five-hour culture was positive. Two of these cases were confirmed by subsequent cultures. No subsequent cultures were obtained on the third case, and only release cultures on the fourth. On each of these four cases from twenty-seven to thirty-nine hours were saved.

In brief, given one hundred persons having diphtheria bacilli in their throats examined by all three methods, the results might be expected to be somewhat as follows, following the figures obtained in our own work: —

(It is supposed that one swab is taken from each of the hundred persons having bacilli in their throats. The swab is inoculated on serum, and the swab examined at once. The serum is incubated for five hours and examined, then incubated for nine hours more and again examined.)

100 swab examinations, 62 positive, 38 negative or unsatisfactory. Examined at once.

100 5-hour incubations, 86 positive, 14 negative or unsatisfactory. Examined in five hours.

100 15-hour incubations, 92 or 93 positive, 7 or 8 negative or unsatisfactory. Examined in fifteen hours.

Our work has shown that positive swabs sometimes come from cases which afterward prove unsatisfactory on further incubation; also, that positive five-hour results sometimes come from cases which afterward prove unsatisfactory after fifteen hours' incubation. Hence there is good reason to believe that a positive result by some one of the three methods at least would be obtained in every case, of the one hundred given above, thus reducing the working-error of bacteriological diphtheria diagnosis practically to zero.

Dr. Chapin, of Providence, has insisted, and very urgently, on the necessity for two cultures for diagnosis in doubtful cases where the first culture is negative. By the swab and five-hour incubation method the number of cases requiring two cultures for diagnosis is reduced, with a considerable saving of time.

NOTE.— By analogy with "wild" and "cultivated" plants, swabs or "natural" forms of the bacilli should be designated as "wild," culture forms as "cultivated."

THE PRESIDENT.— Does any member of the Association desire to ask the doctor any questions upon the matters brought up by this paper? If not, we will now go on to the reading of the next paper, "Food Infection by the Typhoid Bacillus," by Dr. Morse, medical inspector of the State Board of Health. Dr. Morse [applause].

FOOD INFECTION BY THE TYPHOID BACILLUS.

BY FRANK L. MORSE, M.D.,

MEDICAL INSPECTOR OF THE STATE BOARD OF HEALTH.

During the past six months, epidemics of typhoid fever have been investigated in eight different cities and towns with reference to the origin of the disease and a total of two hundred and fifty-six cases studied. From this group of cases, many important facts have been obtained; and, on account of many of the cases developing directly from some food infection by the typhoid bacilli, they are here presented to you in the hope that future cases of the disease may be thus prevented. The investigations in reference to typhoid fever have proved, beyond a doubt, that every case without exception always develops from some preceding one. It is not always easy to trace the origin of a single isolated case of typhoid fever, more on account of the absence of all of the facts in the case rather than from a lack of the specific infection; and so, necessarily, we rely upon the appearance of an epidemic to be studied under favorable circumstances, in order to offer an opinion. And even in the course of an epidemic there is usually some one or more cases in which the connection cannot be or is with difficulty established.

The bacteriological examination of the urine and fæces of most patients ill with typhoid fever show the presence of the specific organism which causes the disease, and to this fact is due the development of other cases. The organisms appear early in the course of the disease, even before the patient is ill enough to go to bed, and remain in the excretions even long after convalescence from the disease has been established. In this way the disease is often unconsciously spread, both before the sickness is at its height and after apparently complete recovery.

The most common mode of propagating the disease is through the medium of milk; and in the study of this group of cases one hundred and forty-seven patients were visited in which the milk supply seemed to be the cause of the disease, with the result of finding one

hundred and ten patients, or nearly seventy-five per cent., taking milk from the same milkman.

These epidemics occurred in five different cities and towns; and in every case some person connected with the milk route was found ill, three of the men having unquestionable cases of typhoid fever, one having an abdominal sickness, diagnosed as appendicitis, and the remaining one having what was called influenza. It is a singular fact that by the time the discovery of the specific cause of the disease is made it is on the decline; for, if you will review for a moment the history of such an epidemic, you will observe that the original case, be he the one who does the milking or the driver of the team, feels poorly for several days before giving up work. During these four days in which the early symptoms are developing, he usually has some diarrhœa. The discharges contain the typhoid bacilli, and become lodged upon his hands and clothing. If he washes his hands, — which, by the way, is not usually done, — that means of infection could perhaps be averted; but, once having become contaminated, it is a comparatively easy matter to carry the organisms to the milk, where they propagate and subsequently infect the persons who drink the milk. Allowing from ten days to two weeks to elapse before these patients become ill with the disease, the original case is by this time sick in bed; and, consequently, the source of the disease being stopped, no other cases develop.

If the infection is not carried directly by the hands or clothing to the milk, it may be carried, particularly at the farm, by means of the fæces to the well, which usually is near the privy, where either the milk is cooled or the cans are washed. If the water of the well is boiled, that will kill the organisms; but it has been observed that, after the cans have been scalded, they are rinsed out with cold well water, thus allowing the organisms to remain in the can. To illustrate how easily sewage can get into well water, it is only necessary to state that the analysis of a suspected well examined only a short time ago showed nearly twice as much pollution as is found in crude Natick sewage; but, in spite of this fact, the well was used daily for drinking and cooking, and no suspicions were attached to it. Another way by which the disease is also spread is by eating different articles of food which are served uncooked, such as oysters, clams, greens, and

various vegetables. These foods, when they cause the disease, usually become infected in the process of fertilizing the ground upon which they grow with sewage which contains the undisinfected stools of a typhoid fever patient. Such an epidemic, comprising fifty-three cases, has been recently investigated in which these cases occurred by the eating of celery. They could be studied under most favorable circumstances, for they appeared in an institution having two seperate and distinct classes of patients. The cases occurred, with but four exceptions, among one class, and not among the other. Both classes had the same milk, water, and other articles of food; but celery, being an extra article of diet, was supplied to one class, and not to the other. The four exceptions above mentioned were patients who became ill with the disease during the latter part of the epidemic,— in fact, all of them on the same day, and just about two weeks from the outbreak of the epidemic, probably receiving their infection directly from a nurse who had the disease. The method of their sewage disposal, together with the presence of an unrecognized case of typhoid fever, furnished the original means for the development of the disease. The sewage was conveyed by means of a large iron pipe a distance of several hundred yards to one of two filter beds, and deposited thereon, the liquid portion overflowing into a brook and the solid portion remaining upon the bed. About one year ago an imported case of typhoid fever appeared, which went unrecognized until near the end of the sickness. The stools, necessarily containing large numbers of typhoid bacilli, were consequently deposited on the filter bed, and not disinfected. Later in the winter another case appeared under the same conditions, thus furnishing ample evidence of the infection existing on the filter bed. Shortly afterward the sewage was turned on to the second filter bed, the first allowed to drain off, and the solid portion taken to fertilize the grass ground and the celery bed. On account of the method employed in raising celery,— by banking the stock with the earth,— it seemed to be a favorable medium for the transmission of the disease; and shortly after it was supplied to these persons the illness began to appear. As the number of cases increased and a cause was looked for, the celery was suspected, and orders were issued for no more of it to be used; and some which was already prepared for eating was locked up, in order to prevent anybody using it.

It is a significant fact, however, that one of the farm hands who had access to it, either not knowing the restrictions placed upon it or through ignorance of the danger from eating it, did eat some, and in eight days was taken ill with the disease, thus apparently adding to the evidence as to what food caused the epidemic. Since such restrictions have been in force, the cases have rapidly decreased in number.

Another class of cases are those developing insidiously, extending over a considerable period of time, with no common origin. Such an epidemic of fifty-six cases has recently been studied in a small manufacturing town, unequipped with a sewerage system. This epidemic, lasting over a period of three months, is on the decline at the present time, but has not yet come to an end. The patients attacked are of the poorer classes, who on account of their surroundings have improper medical treatment and little or no nursing. In some crowded houses, with poor accommodations, from three to eight cases have appeared, extending over a considerable length of time; and they unquestionably receive their infection one from another. Where such an epidemic as this arises, some competent person should be employed by the health authorities to instruct the people in regard to the nature of the disease and the means by which it is spread, paying special reference to the disinfection of the stools and to a system of cleanliness about the house and grounds.

The remedy to prevent the development of typhoid fever epidemics can be briefly summarized: —

1. Disinfection of the discharges of every patient ill with the disease.

2. Isolation of the patient to such a degree as to prevent all possible contamination of articles of food or drink by the excretions of the patient.

These suggestions, although well known, should be applied in the earliest course of the disease; for it is at that time that most of the danger arises. And when in the earlier stages of the disease, particularly on a milk farm, typhoid fever is suspected, all precautions should be taken to prevent the pollution of the milk.

THE PRESIDENT.— You have heard Dr. Morse's paper, and the subject is now open for discussion by the Association. It is the good fortune of the Association to have with us to-day one who has given a more complete, a more rigidly scientific character to the investigations of typhoid fever than anybody in this Commonwealth, one to whom we owe much for the introduction of a thoroughly complete scientific method and a consistent regard to the biological side of the question; and I hope Professor Sedgwick will be willing to say a little to us upon this subject.

PROFESSOR SEDGWICK (Boston).— *Mr. President and Fellow-members,*— I am sure that you must have enjoyed, as I certainly have, this admirable presentation of a most excellent piece of work. In fact, so modestly and so simply has Dr. Morse told his story that I fear there is a little danger that some of us may not appreciate the real significance and magnitude of his work. In some directions it is, perhaps, a confirmation of work which has been done in other countries; but, as regards the celery epidemic, it seems to me that a new and distinct step forward has been taken. It has long been recognized that articles of food like celery probably sometimes carry typhoid fever; but I do not remember to have read of any case — even upon sewage farms, where vegetables are raised and obviously watered with sewage — in which celery or other vegetables have been conclusively proven to be the vehicle of typhoid fever. I may be wrong in this; and, if so, Dr. Morse will correct me. But this is certainly a most interesting discovery, and I like to feel that the good old Commonwealth of Massachusetts is keeping up its reputation in this kind of work. The Association will remember that Marlboro in 1894 furnished the first epidemic in America of typhoid fever due to infected skimmed milk; and, if I am right in supposing that this is the first epidemic conclusively traced to celery,— and it does seem to me very conclusively traced to it, for the reasoning seems sound and the proofs seem ample,—then, again, we have led the country, and perhaps the world, in actually proving a case of the conveyance of typhoid fever by this particular vegetable.

In regard to the remedies which Dr. Morse proposes, these, of course, are sound, but difficult, in the case of typhoid fever particu-

larly so,— so many unrecognized cases travel about, so many early cases do damage before they are discovered. While his remedies are all good and reasonable, there is, after all, only one final remedy, which is to beware of uncooked food under all circumstances, as far as one can. I don't mean to say that we should give up eating celery, I don't mean to say that we should stop drinking milk; but I do mean to say that, when possible, when we are uncertain as to the origin of the celery or the milk,— and especially when celery comes upon the table, as it sometimes does, in the whole-stalk form, so that, as you peel off the outer leaves and seek for the tender innermost "chit," or central portion, you see little black particles of dung down there, as I have often seen them,— it would be wise for you and me and everybody else to avoid that particular kind of celery. The custom has come in, and I see prevails here, of scraping the individual stalks. You, sir [addressing the host], have had the celery properly prepared for us to-day, as I observed, knowing that something of this kind was to come up [applause]. The celery has been scraped; and whatever typhoid germs may by accident have come upon the celery from some other town [laughter] have been removed, no doubt.

Celery is often eaten cooked, as we are all aware. And here again the great and the only final salvation will be; first, in avoiding dirt, or in the securing of absolute cleanliness; and, in the second place, in the use of cookery. The human race never made a discovery, probably, so important as the use of fire in cookery. Charles Lamb has pointed out to us the æsthetic and gastronomic importance of the discovery of cookery, but Charles Lamb was not a member of the Massachusetts Association of Boards of Health. If he had been, I have no doubt he would have dwelt also, and even more, upon the sanitary importance of cookery.

All this line of work, it seems to me, is admirable. It is by this painstaking seeking out of the causes of things, and then the eternal preaching of the remedy,— cleanliness, absolute cleanliness, perpetual cleanliness, and cookery by fire where cleanliness is not possible,— that we can alone escape all danger. Obviously, the time is not ripe altogether for these. We shall go on using uncooked milk. We shall go on using uncooked vegetables [taking a bunch of grapes

from the table]. These grapes from California! Who knows who picked this particular bunch of grapes in California? Very likely a typhoid patient [laughter]. And yet you and I will cheerfully eat those grapes. We have to run some risks in this life, but we shall be wise to run as few as possible; and we shall run the fewer, the longer men like Dr. Morse keep at work.

DR. FRENCH (Clinton). — Mr. President, I think it would be of interest to the members present if these men who are studying the subject scientifically would give us their opinion as to the most thorough practical means for disinfecting the typhoid stools.

THE PRESIDENT. — Dr. Morse, you seem to be called upon for an expression of opinion.

DR. MORSE (Boston). — There are certain regulations which are made by every local board of health just in reference to this question. I suppose from reading that the best method that is known is by the very liberal use of chloride of lime. That is a very powerful disinfectant. It is easily prepared, it is not very expensive, and, on the whole, it is thoroughly reliable. A strong solution in water should be added to every typhoid stool, including both the fæces and the urine, and allowed to stand in it for certainly half an hour,— longer, if possible. In that time it is supposed that all the typhoid fever bacilli will be killed.

PROFESSOR SEDGWICK (Boston). — Mr. President, I meant to have referred in my previous remarks to the excellent recommendation of Dr. Morse that, in a village where there is no regular board of health or no adequate supervision, it is often possible to secure such by going to one of the selectmen, and telling him just how to do it. In the Bondsville epidemic, which I had the honor of investigating, in 1892, we had a case of that kind. It was one of the "secondary infection" epidemics, like the one reported by Dr. Morse; and there was genuine alarm in the town and a strong desire to do the right thing. I recommended to the selectman — who was, of course, a member of the Board of Health — that he should appoint a bright physi-

cian in that town, and make him responsible, make him for the time being a health officer, holding him responsible for the proper carrying out of the disinfection. Then I advised him to purchase a large amount of unslaked lime, and to distribute this free of charge; to see that everybody in whose house there was any typhoid or any threatened typhoid should have plenty of it; and to see *himself* that it was actually put in there, and that the physicians in charge did attend to its use. This was carried out very faithfully, I believe, with the result that the epidemic was choked quite soon,— as soon as could reasonably have been expected. The families affected were of the poorer class. They were not able to buy disinfectants, and did not know how to use them. Just one health officer, a temporary health officer going around, controlled the whole thing, and brought a force to bear which was very salutary. I think that that can be done in many cases where there is no well-organized board of health. The disinfectants at such a time should be provided by the town, free of charge, so that there should be no excuse for their non-use. As for the idea of instructing the people, I think that is good, too; but it is not quick enough. There must be a strong arm *at once* to insist on the proper use of disinfectants, and somebody to see that it is done. After that may well come instruction, and even with it may go instruction; but there must be first an authority, and an intelligent authority, with energy and executive ability and plenty of disinfectants. Then the rest will follow very quickly.

Dr. Burr (Boston).— Mr. President, in connection with Dr. Morse's paper it might be well to report a recent epidemic which occurred in Boston. October 4, in looking over the typhoid records, we found quite a number of cases occurring in a certain district. As is the custom in all cases, the milk supply was looked into; and it was found that in the great majority of those cases the milk supply was from one milkman. He was immediately visited, and it was found that the physicians in the district had sort of intimated to him that they believed the epidemic in that district was due to the milk supplied by him. Becoming somewhat aroused at it, he reported to his contractor,— that is, the contractor who supplies him with milk,— stating to him that the physicians had thought that the milk supplied

by him was infected. The contractor that afternoon looked over ten or more different dairies which supplied this milkman, and upon one of those dairies a case of typhoid fever was found.

We went that afternoon directly to that farm. The farm is an average farm. I think you might call it a fairly good farm. I found that the son of the farmer had died on September 16 with typhoid. The son worked in Boston, and went home to the farm occasionally. It was his custom to go home on holidays. Saturday before Labor Day, September 1, I believe, he went home, as stated by his mother, because of feeling a little ill, and also to spend the holiday. Sunday, the following day, he was feeling ill, and Monday the same. Tuesday he went to bed, and on the 16th of the month he died. There can be no doubt but what the son was affected with typhoid in Boston; that is to say, this case, which afterward infected the milk at the farm, originated in Boston. In trying to find some possible source whereby the milk became contaminated while on the farm, I had quite a task before me. I will say that the case was very well taken care of, as told by the farmer's wife; but I found that the father was accustomed to sit with the patient in the sick-room, and among other things he did occasionally remove the stools to some portion of the farm. The stools were always treated with chloride of lime in the vessel, and also buried in the field, covered with lime again. It was stated that he removed the stools on a pitchfork. I don't just understand how he got them on the pitchfork [laughter]; but it must have required the use of the hands, at any rate, to get the vessel on to the fork, and also to throw them into the hole which he dug in the ground. I have no doubt he thought that he was taking excellent precautions. Even though handling the stools as above described, he also assisted in milking the cows. It was probably at the time of milking that the milk became contaminated from the hands of the father.

In referring to the epidemic, we find that from September 29 to October 13 ninety-three cases of typhoid were reported in Boston. Fifty-seven cases occurred in Dorchester, which is the district where this epidemic occurred. Forty-eight of those fifty-seven cases received milk from the same milkman. This milkman was a pedler of about fifty cans. October 13 we began to have a dropping off in the

cases. When you consider that the milk supply of Boston is about twenty-eight thousand cans daily, and this pedler supplied only fifty of those twenty-eight thousand, and that more than half of the cases in Boston, forty-eight out of ninety-three, came from this milkman's supply, you can see what a great epidemic may be caused by a very small percentage of the total milk supply of any large city. The case at the farm having originally come from Boston, the sanitary condition of the farm, I think, could be thrown out immediately, as playing any part in the source of contamination. But, to show you that the epidemic that we had must have originated from the milk supply of this farm, I will just give you the records of the cases which occurred in Boston previous to this epidemic. He went home September 1. Of course, his infection must have been some two weeks previous to that. From August 16 to September 1, the two weeks previous to the time he went home, only one case of typhoid occurred in Dorchester. For the entire month of August only two cases occurred in Dorchester. Then he goes home to the farm; and September 1 to September 29, when we noticed the beginning of the epidemic, only eight cases occurred in Dorchester. After September 29 we began to have a large number; and, as I say, from September 29 to October 13, when they began to decrease, we had forty-eight cases out of fifty-seven cases in Dorchester, all received from the milk of this one milkman.

As soon as the milk pedler found out that there was typhoid at any of the dairies in his milk supply, he shut off of his own accord the entire supply, receiving his milk from an entirely different locality. His place was disinfected in the usual way. The cans and bottles, etc., were all treated with a two per cent. formalin solution for four days. They were washed as the milkman always washed his bottles, then after that treated with the formalin solution for four consecutive days. The reason of treating them for four consecutive days was that in large cities the milk pedlers seldom get their cans and bottles back within forty-eight or seventy-two hours, in some cases even longer. I know that in his case the disinfection was carried out for at least a week.

THE PRESIDENT.— Does any other gentleman desire to speak upon this subject or to ask any questions of the previous speakers?

DR. BURR (Boston).— Mr. Chairman, I might add a word, that I understand within two or three days the father, or the farmer whom we suspect infected the milk, has been ill — he is ill now — with slow fever in the Provinces.

DR. BIGELOW (Leominster).— Mr. President, I think I understood by Dr. Morse's remarks something in regard to the source of contagion through the clothing. I would like to ask him to explain how much this disease can be carried through the clothing.

DR. MORSE (Boston).— I do not mean to convey the idea that the disease is carried directly through the clothing; but, as a person coming down with typhoid fever has considerable diarrhœa, when he attends the calls of nature, it is practically impossible for him to escape infecting both his hands and his clothing. And, having infected either one, unless they are thoroughly washed or disinfected at that time, the organism stays where it is placed. The next time his hands came in contact with his clothing, even if he had disinfected his hands previously, they would be reinfected. The danger would be from direct infection from his clothing by his hands to the milk rather than directly from the clothing to the milk itself. It leaves the clothing in an infected condition.

PROFESSOR SEDGWICK (Boston). — Mr. President, perhaps I can help Dr. Bigelow a little bit as to his question. It is well known that laundresses are very frequently infected by handling clothing from typhoid patients. There are a great many cases on record.

As long ago as 1873 Dr. William Budd, one of the great authorities on this subject, made it perfectly clear that washerwomen had received infection by handling clothes which were infected and so infected their own fingers, and then their own food, and thus themselves. I myself saw a case like this on one occasion,— a case which is unpublished, because it was in a girls' school, and it was not considered desirable to have it made public.

A girl fell ill with typhoid fever, which she brought into the school, probably from Lawrence; for it was at the time when Lawrence was drinking the Merrimack River unpurified. Her night-dress became soiled with excreta. It went to the laundry. The chambermaid, who gathered up the clothing from the different rooms and was known to have handled this, just two weeks afterward came down

with typhoid fever. The clothing went on to the laundry; and the washerwoman also, two weeks after, came down with it. A table waitress in the same school, who sat at table with the laundress and the chambermaid, came down with the typhoid fever. I found that they had actually sat at the same table, and I got this statement: that the waitress of the scholars' table, who was eating at the servants' table, had actually had handed to her pieces of bread cut by the chambermaid and handled by the washerwoman; and from this infected clothing there apparently came a whole crop of cases among servants and pupils, and the school had to be closed.

THE PRESIDENT. — If the Association will pardon me for adding a personal experience, I would say that I have had in my own experience, in a hospital with which I happen to be connected, an instance of the production of typhoid fever by this sort of infection. I have always talked to the nurses there, as of course every other physician has in every other hospital, about the danger of dirty hands; and I have always impressed upon them that what I meant was not the obviously dirty hands, but the infected hands. The matron, who was a bright woman of middle life, not inclined to receive instruction upon subjects upon which she supposed herself to be thoroughly instructed, as is not uncommon with ladies of middle life and unmarried, rather resented the supposition that anybody in the hospital would be so unclean as to contaminate her hands with the fæcal discharges of the patient, and not wash them. I let the lesson go. My instructions I did not recall, however. I did not apologize.

Things went on, and we had a good deal of typhoid fever in our hospital. One patient was moved into a private ward which is in the main building of the hospital, and occupied a room next to that occupied by the matron. The matron became extremely interested in the case. She was in the room repeatedly. After a few days — after a few weeks — she became sick herself with typhoid fever. I was self-restrained enough not to tell her in the beginning of it, "I told you so." But I waited till she got well, and then I said to her: "When did you get that thing? Where did you get it?" "Oh," she said, "I don't know where I got it." "Well," I said, "I

told you not to dirty your hands. The nurse who took care of So-and-so in the next room says that you came in there one day when the patient had had an involuntary discharge of the bowels, and that you removed the sheets." "Oh, yes," said she; "but I looked at my hands, and I saw that I had not got anything on them." She did get something on them, she got it in her mouth, and she got typhoid fever. That was the sequence.

We have a belated nomination for membership in the Association, of Dr. P. F. Gorham, bacteriologist of the Providence (R.I.) Board of Health. Is it your pleasure that he be admitted a member of this Association? If so, you will please to signify it by saying ay: contrary-minded, no; and he is so admitted.

The programme ostensibly places me upon the list of speakers. There are a certain number of gentlemen here who have descended certain descents and who have climbed certain ascents in the Metropolitan water basin, who don't care to hear anything more about the Metropolitan water basin at present, probably. They have had an object-lesson, they have had a laboratory demonstration of what the basin means; and they are so numerous in this body that it would be a pity to inflict upon them anything more with regard to it. Seeing so ample a representation from Clinton here, I am going to say that the real interest in that basin will come when we begin to construct the dam. We shall be thoroughly at work upon the dam in the course of two years; that is, we shall begin next spring. The dam itself, however, will show its head above the bed of the river the year after that. I presume then that the Clinton Board of Health would insist upon our coming to Clinton for a meeting, and that we would then go out and see the dam. It would be a short walk, not a troublesome one [applause]. I presume we should also get something in the way of refreshment, having in view the fact that such a magnificent example has been set to them [applause]. I understand that Clinton indorses that; and therefore it would be useless for me to say anything more upon that subject, particularly as the train leaves for Boston in about five minutes. Is there any other business to come before the Association at this time?

Dr. Woodworth (Fitchburg). — Mr. Chairman, in behalf of the Board of Health of Fitchburg and the Mayor and the City Government, I wish to tender an invitation to this Association to meet with us in Fitchburg in April, if they have not already decided upon a place of meeting for that date.

The President. —This kind invitation will be referred to the Executive Committee, and will be considered by them and reported upon at the January meeting.

Adjourned.

Members of the Association had devoted the morning to visiting the Metropolitan water basin under the escort and as the guests of members of the Leominster Board of Health. Special trolley cars were provided for the occasion.

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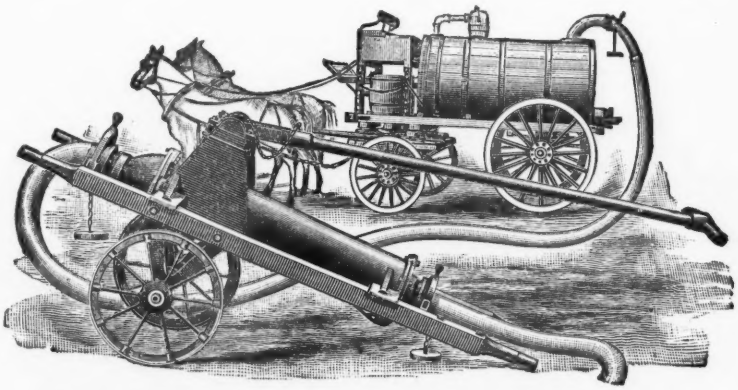
The Board of Health,

(Signed) S. H. DURGIN, Chairman.



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